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ABSTRACT

This study focuses on efforts to reform the Czechoslovak educational system through a full integration of scientific and technical subjects into school curricula. Section 1 discusses the future development of the Czechoslovak education system in light of such sociopolitical factors as the establishment in 1976 of a long-term educational democratization and reconstruction program, and the increased tempo of scientific and technological progress. The reconstruction program proposes a 12-year general education as preparation for a broad range of vocations and further education that would fulfill the requirements of an advanced socialist society. Section 2 argues the need for a complete integration of specialized and technical education into the education system from preschool through secondary training. Included are 12 tables of curriculum data indicating courses of study required for various kinds of employment, from the vocational to the academic. Section 3 discusses the planning and development of specialized and technical education in Czechoslovakia in the context of objectives established by the Communist Party and the State, including the development of social production and a socialist personality.
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SCIENTIFIC AND TECHNICAL
EDUCATION IN CZECHOSLOVAKIA

Václav Císař
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Research project directed by
R. M. Avakov

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INTRODUCTION

The present case study of the Czechoslovak educational system shows how a reform of the educational system provides for a full integration of scientific and technical subjects into school curricula offered to the young generation today. A special emphasis is given to those aspects which may be of interest to other countries, especially in the developing world.

The study attempts a critical analysis of the theoretical principles behind the practical implementation of scientific and technical studies into the educational system in such a way that it would meet the requirements of the country's social and economic conditions and of governmental policies for the development of science and technology.

The study tries to point out areas from where future improvements in the educational standard of the young generation in science and technology may emanate. It also hopes to formulate guidelines for the implementation of concrete changes so that they correspond with the strategy and planning in education.

The Czechoslovak system of education is a highly developed structure, providing facilities for teaching both young people and adults those subjects which would equip the modern workforce in industry and agriculture, as well as the whole plethora of research workers in the scientific, technical and cultural fields with the necessary knowledge. It carries an essential influence on the social, political, economic and cultural development of the country and on the living standard of the population.

Future development of the education system is governed by the requirements of the general development of a socialist society, by the necessity to strengthen its economy, by the demands for integration with other members of the CMEA countries, and by the advances of science and technology of a world scale.

To educate members of society so that they lead quality life, fit in with the community, show a communist attitude to work, maintain a healthy and fit body in order to be able to carry out social and public activity, work successfully in the chosen field of activity, enlighten society, be prepared to defend the socialist fatherland, is the ultimate aim of socialist education. A very high aim, indeed.

This, in turn, places demands on everyone to fit in successfully where the development of socialism requires it. The education system is designed to improve the knowledge in the various qualifications and to produce social awareness in the young generation, and especially in the worker as the main protagonist and guarantor of socialism.

For these reasons, the main aim is to provide fully secondary level education for everyone and to increase the numbers entering universities. Together with the education of the young goes the development of continuous education of the adult population. Only thus will the demands of future development be met successfully.

In order to fulfil the aims set before the education system, it is necessary to change the entire concept of the curricula of the individual types of schools. It is necessary to strengthen and develop the polytechnic aspect of education and to widen the qualification patterns in order to enable the working population to adapt easily to the changing social and economic conditions.

The content and organisation of the education system must correspond closer and closer with the real conditions in everyday life of the working population, and conversely, the newly emerging requirements in real life must be met by a system flexible enough to effect change with speed when necessary.

The authors wish most sincerely that the present study will provide anyone interested in any aspect of education with new ideas for finding ways through which the best possible improvement of present systems could be made.

The specialist will be provoked to critical discussion, as should be the case with every work of this character. This only proves that much effort still has to go into the study of the many questions which still remain open in finding the best path for further development of education systems as a whole, and of scientific and technical education in particular.

The authors will be grateful to receive contributions to the discussion.

I. FUTURE DEVELOPMENT OF THE CZECHOSLOVAK EDUCATION SYSTEM

Socio-political postulates

Thirty years' experience of national education in Czechoslovakia as a significant prerequisite in the successful development of a socialist society led to important changes in 1976. In that year the Central Committee of the Communist Party of Czechoslovakia and the government of the Czechoslovak Socialist Republic⁽¹⁾ agreed to a long-term programme for the future development of the education system in Czechoslovakia,⁽²⁾ mainly aimed at speeding up the process of democratisation in education. The programme is designed to implement the political orientation given by the XIV and XV Congresses of the Communist Party of Czechoslovakia and the Session of the Central Committee of the Communist Party of Czechoslovakia in 1973, which set out plans for creating conditions at every level of education to educate young people as useful members of a socialist society.

Clearly present in the programme are ideological, political, democratic, cultural, pedagogical and purely technical standpoints.

The classics of Marxism-Leninism have pointed out that social development is the result of the laws of historical development, especially that of labour, i.e. production forces and production relations. Generalisations of this process and theoretical conclusions from them are being handed down to new members of society - to the young generation. The entire process is intensified with the increased tempo of scientific and technological progress⁽³⁾.

(1) Ministry of Education of the Czech Socialist Republic, Ministry of Education of the Slovak Socialist Republic: Future Development of the Czechoslovak Educational System, State Pedagogical Publishing House, Prague, 1976.

(2) According to B. Kujal, communist education is conceived as the "comprehensive, purposeful formation of man, of an allround and harmoniously developed member of the socialist society. Its basic components are education in the traditional sense plus other considerations" (see Kujal, B.: System of education in the Czechoslovak Socialist Republic and certain theoretical and methodological problems of its research. J.A. Comenius Pedagogical Institute, Czechoslovak Academy of Sciences, Prague, 1972).

(3) Collective of authors: Man, Science & Technology, Svoboda, Praha, Moskva, pp. 161-167. Kujal B. et al. PERSPECTIVES OF A COMMUNIST EDUCATION IN A SOCIALIST SOCIETY. A report. Comenius Pedagogical Institute, Czechoslovak Academy of Science, Prague 1977.

Experience of the past two decades has shown that basic education plus practice are an insufficient tool for enabling a person to perform the many complex social and political activities of a modern socialist society. As the development of society becomes more dynamic, a member of society must be educated by both theory and practice on a level corresponding to the increasing rate of development. The primary requirement, therefore, is to educate an allround person who would be in harmony with the society in which he lives.

Characteristic factors in this situation are: all members of society have equal opportunity for achieving the kind of social involvement which would allow self-realisation within the scope of individual abilities and interests;

- by implication, socialist education provides everyone with the opportunity to reach a certain level of education which would correspond with the present and future needs of society.

- the dynamic process of development in a socialist society and changes in material conditions of the population alter the entire concept of education - the schoolroom as a special and temporal institution preparing the young person for future life is no longer sufficient. Education becomes a broader discipline in society, which aims at a continuous education through life and by life.

- the effective and rapid changes in the living conditions and in society in general demand that a member of society is not only educated to a certain level of knowledge on completion of schooling, but that he is equipped with the knowledge of how to continue acquiring new knowledge and information from the vast amount of new scientific, technical, political and economic developments.

- the improved material conditions also call for an adequate improvement of the ethical moral and broadly cultural level of each individual.

It is abundantly clear that the demands placed on the educational establishments are very high indeed, as they have the obligation to prepare the young generation by equipping it with knowledge as well as educating it towards a high moral standard. It must also strengthen further the democratic aspect of education.

Basic aims for the future development of the education system

The formulation of the basic aims for the future development of the Czechoslovak educational system is based on the premise that all knowledge must be directed towards the best possible implementation of scientific and technological advances in practice, and towards the enforcement of changes in the working conditions of the population and in their standard of living. This means in practice that members of society attain higher levels of education and that they are deepening their ideological commitment on the basis of studying Marxism and Leninism.

Further strengthening of the democratic aspect of education is imperative, as the outcome of education is to ensure that the interests of each individual coincide with the interests of society. Each individual should, ideally, fit into a work process which, in turn, enhances each individual personality. This process pre-supposes an even, allround development. Young children should follow an even development, occasional retardation should be overcome so that a common level is attained from which the talent of each individual is then developed further. The talents may be varied and may lie both in the mental and manual work fields.

All these talents should be valued in such a way that no elite emerges which would be contrary to the ideology of socialism⁽¹⁾. Democratic entry to education must be matched by a democratic attitude at the "exit" point, displayed by the response to the current and prospective requirements of socialist society.

Strengthening of the democratic aspect may be achieved - by providing organized pre-school education for all children, without forgetting the importance of parental and family influence.

- by developing the content and methods of elementary education in such a way that it provides information on life in a socialist society and forms conviction in the young person that knowledge is the basis for both general and specialised development; it should also be aimed at ridding the educational system of the remaining differences between the town and the provinces. Special facilities will be provided for physical⁽¹⁾ and mentally handicapped children which would be integrated into the general education system.

(1) Kujal, B. Czechoslovak adult education and the polytechnical school and their future development. In: PEDAGOGIKA 25, 1975, p.525.

- by creating conditions for raising the level of education so that complete secondary school education is available to the majority and ultimately, to the entire young generation. Vocational schools play an important part in bringing the widest possible number of young people to an educational level equal to grammar schools. Vocational schools are attended by young people already engaged in production. By completing the secondary course of education they, too, will have the necessary qualifications either to continue in studying or in using higher level of knowledge in the work process. The concept of the secondary vocational school as an educational establishment for acquiring theoretical and cultural knowledge in combination with practical experience is the prototype of the socialist school of the future.

- by gradually introducing a system of adult and refresher type of education for all member of society.

- by creating a situation where education becomes the object of not only interest but also of continual practical use.

The question arises of how the aims for the strengthening of democratisation are determined.

First and foremost, they are determined by changes in the material conditions and standard of living brought about by rapid scientific and technological advances: the progress changes the working conditions and provides new stimulation and motivation. In toto, the changes also lead to changes in the demands placed on each individual.

Working conditions are influenced to the greatest degree by the improvement of tools. We are increasingly witnessing how semi-automated and automated technologies gradually take over the manual and routine functions and release man to manage and control production and to improve conditions around him. This process also often produces new aspects to the nature of the means of production.

It is evident that we are not seeing man's complete and absolute freeing from participation in the production process. What we do see is a gradual release of man from physical work in proportion to the scientific technological advances. Technical progress eliminates the physical limitations of man which themselves were an impediment to progress. Man is thus liberating his own self. The machines which have been constructed by man free him from excessive physical effort, from fatiguing and one-sided

mental activity. However, no machine is able to free man completely from production as there always will be a specific function to perform arising from his duties as a useful member of society⁽¹⁾.

Changes in the work process are especially marked in the traditionally manual occupations. The proportions between manual, mechanized and automated operations have changed enormously. This, in turn, leads to broadening in the acquisition of skills and in amalgamating jobs⁽²⁾.

Amalgamation of job practices is the visual outcome of a basic shift which is taking place - a shift from the manually performed field of "crafts" consisting mainly of sensomotoric skills to a sphere of intellectual activities. We are discussing such activities as the evaluation of production processes assessing the product and the means of production, and understanding technological potential. Decision-making becomes the new job of the worker. The worker must co-ordinate his work with that of others; he manages, checks, maintains and repairs complex mechanisms, etc. This assumes knowledge of the production processes including the theory underlying the respective fields.

Such a qualification requirement is placed on a worker who is capable of job amalgamation. He is a specialist in quite a wide field. The shifting of emphasis from doing to managing and controlling increases the proportion of workers with higher level of training.

The changing nature and social composition of the labour force engaged in production induces an increase in the demands on the average qualification of the worker and on the level of specialised training.

Changes in the production forces are accompanied by changes in the lifestyle of the worker. Increased level of consumption increases productivity; leisure time is extended and is used more effectively, the sum total leading to a purposeful improving of the living conditions and of the environment. The same factors in turn boost economic development and become the driving force of future growth.

The relationship between material consumption and education is significant. Within the process of population reproduction in the new conditions come changes in the professional structure. Czechoslovakia sees the gradual disappearance of differences between the living conditions in cities and in rural areas; there is a new demand for commodities and

⁽¹⁾ Afanasyev V.G. Scientific and technical revolution, management and education. SPN, Prague, 1976, p.145.

⁽²⁾

services. The broadest strata of consumers places new demands on the quality of goods, on the quality of services and often calls for new kinds of service, new products etc.

Thus, the greater demands on the production process the greater demands on the quality and educational level of the employees in the service sector.

As this process gathers speed it is necessary to apply new criteria in judging economic effectiveness in satisfying the needs of the consumer and of the environment.

As the intensity of changes in the work process increases and leisure time is used more effectively, the demand for continuous education grows in proportion. The characteristic aspects of the new trend are that education becomes indispensable not only for professional reasons but also for the reasons of self-realisation and enhancement of individual and social interests. Both the economy and socio-political engagement of the population are increasingly dependent on the educational level⁽¹⁾.

The changing character of labour gradually leads to the abolition of the old division of labour into manual and intellectual, manifested most strongly in city and rural conditions. A final disappearance of these differences will produce a homogeneous society. Such society according to Lenin, consists of a working population in which there are no class differences.

The process towards the attainment of this goal must be accompanied by continuous improvements in education.

Creating conditions for completing secondary education at the age of 18 with a national certificate and including in it the working youth ensures the continuity of the working class. Working class youth and its life style are conditioned by two extremely important factors. Firstly, the working class is extremely stable - 56 per cent of the working class is second generation. Secondly, only the working class guarantees the continuity of values, especially those which put the interests of society and long term improvement above the interest of the individual and for immediate benefits. Only the working class has shown uncompromising stand

(1) Duben, R., Stibálová B. : How shall we be living in the year 2000 ?
Svoboda, Prague, 1976, p. 13.

against exploitation and unhealthy competition and displays a disciplined, collective attitude. These values are prevalent in a socialist society as a whole but are naturally inherent only in the working class. In this sense, the working class is an example to society as a whole. To inspire these qualities in all young people, not just in the working class element, is one of the aims of the modern educational process. The entire concept of aims in education and methods by which to attain them in Czechoslovakia arises from these postulates.

The realisation of our aims in education has social, political, economic and cultural consequences. New concepts in choosing the depth and breadth of the courses' content place special emphasis on the poly-technic subjects as the school leaver and graduate should ideally be equipped with the ability to adapt rapidly to the changing conditions in socialist production and in social activities in general.

This requirement is based on the premise that man develops positive attitudes through the process of acquiring knowledge of nature, of society, of science and technology, of art - i.e. an attitude of socialist humanism which presupposes personal commitment to the development of society. Education, therefore, should be based on a unity between character forming, erudition and practical application of knowledge gained.

The necessity to concentrate on the content of educational courses has arisen from the Czechoslovakian experience, as well as of that from the other socialist countries. Experience shows that organisational measures are insufficient in guaranteeing the quality of the whole system, though they may play an important part in the democratisation process. The educational system will be reformed only through the correct choice of a system of courses and a correct choice of the content of each individual course.

At the same time, methods and practical involvement of pupils will be equally important.

The types of courses will be governed by the function of an individual in society rather than by the requirements made by the representatives of individual specialisations. This will put a stop to a passive, encyclopaedic approach to subject learning.

The new approach is based on the premise that the scientific and technological revolution is a reality and its future development will not be the matter of the specialists alone but of all citizens. Every

opportunity should be taken in order to include scientific and technical elements in all educational courses. The very nature of the scientific and technological revolution presupposes polytechnical education as a basis for future specialisation. Everyone should gain a certain breadth of knowledge on the basis of which further qualification may be acquired either by continuing education or through self-education.

Such a system of education forms the material basis for the formation of an active and committed socialist man who has formed the habit of continuing to educate himself and thus develop as a person in harmony with his self and with society. The structure of the system is open, ready to avoid the static approach which had existed, which had passed on to the pupil finite knowledge, the content of which did not allow for transforming knowledge into broad capability to tackle diverse problems and remained for life within the narrow field of individual specialisation. The new types of courses and their content are in harmony with the social, political, economic and cultural goals and prepare a young person to feel secure even if he has to react to changes and adapt to new situations. This way, working and living conditions will be transformed in order to achieve a truly socialist order, and ultimately a communist order. "Educational system has to create such conditions which would thrust the pupil into the social reality, help him to develop active attitudes so that he would wish to transform society and through this, to transform himself"⁽¹⁾.

The new types of courses are aimed to synthesise the general, the polytechnic, the specialised and theoretical, the classical and humanitarian, the material and formal aspects of education.

To achieve this, it must be assumed that everyone will complete secondary education with a pass in the final examinations. Therefore the new structure of courses providing twelve year education is designed to take in men and women who were unable to complete such education and thus to overcome social differences among the young, and ultimately among the entire population.

In this process, democratisation both at the entry and on completion of education is achieved through the type and quality of courses. It is not sufficient to ensure democratic principles for the entrance to education; the courses must be so designed as to ensure that the finalist will reach the planned level. Hence the "democracy in school leaving"⁽²⁾.

⁽¹⁾ A.M. Dostal. Basic problem of content in education SPN, Prague, 1978, p.59.

⁽²⁾ Galla, K. "Further development of our educational system". *Pedagogika* 27, p.8.

The principles of continuous education requires the solution of many concrete problems.

First of all, it is important to act on the guiding principle of a socialist school which is integration with the real life of society. The courses must contain facilities to teach the sciences as well as cultural values and capabilities to manage socialist production and services scientifically and efficiently.

This means that everyone receives polytechnic education consisting of courses in which the content of individual subject learning is fully related to modern science and technology.

The choice of logically posed and didactically effective structures of the subject matter are as important as the knowledge of the subject itself. Subjects must be studied for the specialised knowledge whilst at the same time due attention must be given to subject inter relations.

The learning process provides essential information, and assists in the formation of the student's personality so that it corresponds with the educational goals.

Thus the school curricula will not be overloaded with knowledge unrelated and isolated from the life of society. Thus more time will be made available for independent work of the student - an important contribution to the formation of personality. The teacher will become more of a tutor, directing and creatively contributing to the student's development.

A clearly defined concept of the basic and secondary education in Czechoslovakia spanning twelve years is an ideal vehicle for the integration of a polytechnical, specialised and practical aspect of education. Approach to individual subjects will allow for individual differences among pupils and the content will allow for different abilities, especially in the middle span of the twelve year cycle.

Educational methods and organisation

The new concept in education puts a much greater emphasis on the student/teacher interaction; a dialectic concurrence with the changes in the course content takes place.

Which methods would prove adequate to respond fully to the new aims?

The theory underlying such methods must correspond to the tenet that "theory and its practical application in the activity of both the pupil and the teacher forms a dialectic unity where the aim and content (the external and the internal conditions) coincide"⁽¹⁾.

Educational methods are the sum total of a complex system of activities conducted in the many varied components or aspects of the educating process. Therefore not a single one method can be named as the best. Educational methods, too, do not lead only to the acquisition of knowledge but also to the developing of abilities to look for new knowledge and experience and thus to educate oneself. This way the student is taught to be an active force in the development of society, whilst at the same time he is developing his personality to be in harmony with society.

Needless to say, student's independent work is extremely important and should be encouraged. Thus educational methods fulfil a role of educating as well as providing knowledge and information. For the teacher, the student is less and less the object for educating, but the subject of education.

Modern teaching aids play an important part in educational methods. Independent work with teaching aids and apparatus enables the student to concentrate on his work, so important in the development of personality.

Marxist-Leninist theory of education is a firm basis for developing active educational methods and for putting them into operation. The best known theorists are Zankov and Elkonin. Okon has made important contributions to the theory of programmed learning and its possible application in Czechoslovak education. Chlup concerns himself with the theory of basic subjects learning⁽²⁾ with a special emphasis on the content of the courses.

Organisation of courses in Czechoslovakia is also governed by the dialectical unity of collective and individual work. Collective or individual work separately cannot be checked and governed in such a way that the information is absorbed by all at the same time. The levels attained by individual pupils are haphazard and it becomes difficult to maintain a set programme⁽³⁾.

(1) A.M. Dossa'l: Basic problem of the content of education SPN Prague 1975, p.105.

(2) O.Chlup: Theory of basic subjects learning - In: Ceska B.Kujal: Some theoretical and practical questions how to improve efficiency of education, PUSA CSAV Praha 1970. B.Kujal & Others: Perspectives of continuous education under communism and socialism. PUSAK CSAV Praha 1977.

(3) A.M.Dosta'l: Basic problem of the content of education SPS, Praha 1975, p.108.

The work must be organised in such a way that it provides (a) a programme for learning where information and feedback are regulated within the ability of the pupil; the programme should ensure that the pupil's interest is enriched by knowledge and experience of society; (b) a programme where there would be less rigid structure of timetabling and greater emphasis would be given to other forms of learning, especially in groups.⁽¹⁾

However, even group learning is only one form of the educational process, as that, too, is confined to the time spent inside the school room. Educational methods must take into consideration other forms of learning - mass activity, group activity and individual work, and time must be found for all activities, both inside and outside the school. (e.g. in the Pioneer organisation, in the Union of Czechoslovak Youth, in pupil committees, interest groups, social work, specialised training, etc.)

All these activities are an integral part of the content and methodology of educational organisation.

Structure of the Czechoslovak Educational System

The social importance of education strengthens the case for continuous education. The importance of the role of pre-school education of children and of external education of adults increases.

In compliance with the aims set out, school takes care of the intellectual development of children and the youth, prepares them for practical life and creates ideological and emotional background for the understanding of the tasks of building socialism. It remains the principal educational institution, the activities of which are directed by the state. Education outside school (in various organisations, through the mass media, etc.) is unambiguously conditioned by the central educational work of the school, especially by one of its principal aims, i.e. to develop the ability and habit of continuous self-education.

The relationship between school and extra-curricular activities is manifest by the new concept of educational institutions. The Czechoslovak educational system is conceived as a comprehensive system of education both in and outside school. The school remains a firm basis for the extension of education after school in other educational institutions and into further care for both young and adult students. This fact significantly

⁽¹⁾ A.M. Dosta'l: Basic problem of the content of education SPS, Praha 1975, p.108.

influences the aims and the content of school curricula, their relationships with the social environment, and especially with production organisations.

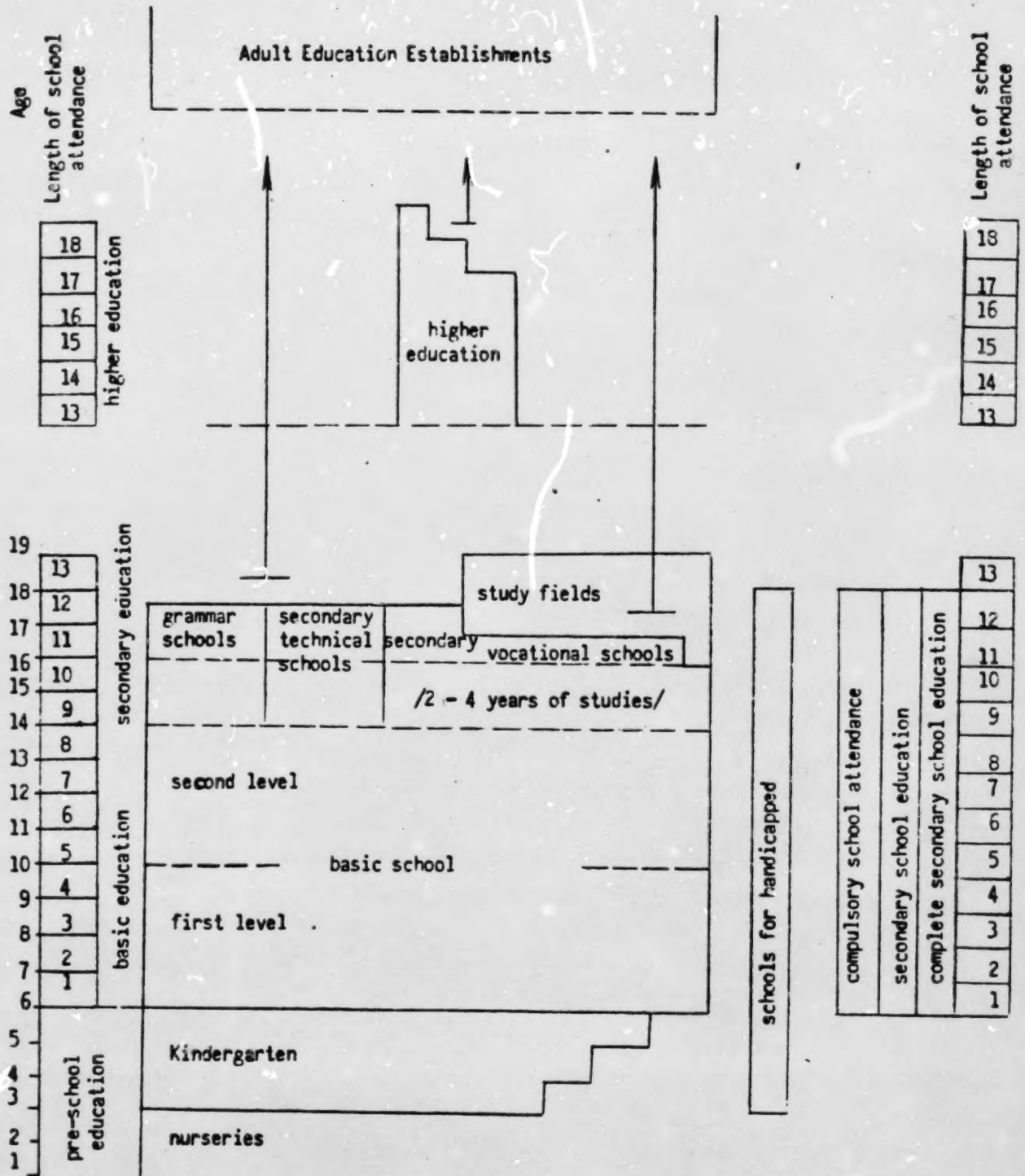
The determining characteristic of the structural arrangement of the educational system means that it is unified, yet open and offering perspectives. It is unified in the sense that it provides a basis for everyone, through one way or another, to attain the highest level of education, to develop abilities, talents and interests, to attain and improve professional qualifications, to enhance each individual personality by means of the opportunities available to them. (see following Flow Chart of the Czechoslovak Educational System).

The core of the system is the twelve-year cycle for young people between the ages of 6-18, providing complete secondary school education, divided into basic school with two four-year levels, followed by secondary schools of differing type: grammar, technical, and vocational. The basic 12-year cycle follow pre-school education which is becoming more and more widespread. In 1980 it extended to 85 per cent of all children of this age group; in 1985 it will extend to 88-90 per cent. Pre-school education aims to safeguard, in co-operation with the family, adequate physical, mental and social development of the child and to prepare it for systematic work in the basic school.

The twelve-year cycle of complete secondary school education divided into 4 + 4 + 4 years has made it possible to distribute evenly the 1st and 2nd levels of basic school and the secondary school. Such structure offered itself when the decision to provide complete secondary education for all young people was accepted.

By changing the internal structure of the 12-year cycle the age in which the young people made their life decisions was shifted from the 15th to the 14th year. This caused grave concern regarding the level of maturity of a fourteen year old who has to make such an important decision. This concern has now been allayed through the introduction of broadly planned curricula and by the fact that the upper age limit of general education was raised from 15 to 18 years. It has been proved scientifically that the mental development of the young population of our time has accelerated.

Flow Chart of the Czechoslovak Educational System



The vertical structure of the system culminates in tertiary education designed to produce highly qualified specialists and scientific workers. Tertiary education is open to everyone who has completed any type of secondary school. The entrance to tertiary education complies with the need for specialists with higher educational qualifications, yet it is open to an increasing number of those who in the admission procedures show the best political, personal and academic qualities.

Further education in a socialist society is encouraged and made possible through many types of courses. The programme for extending further education is closely bound up with schools and educational establishments for young people.

The unified system is further supported by the establishment of special courses for children with specific qualities, talents, interests or handicaps. After-school facilities, school clubs, houses of young pioneers and youth clubs, workshops for young technicians, interest groups for nature conservationists and tourists, are available to develop further the talents, abilities and worthwhile interests of young people.

The system is open in such a way that each level and type of education can be used as a starting point for the next higher level. The system does not have any blind alleys; it provides opportunities for everyone to reach the highest level of education.

The organisation of the educational system opens the road to higher levels by providing a broad, polytechnical education in the first two years of the upper four-year tier of the secondary schools. This completes the compulsory ten-year secondary education of Czechoslovakia. Basic school has a solely preparatory function for higher education of the secondary school population.

The new concept no longer distinguishes between general and specialised secondary schools. By successfully completing any type of secondary school the pupil obtains a certificate of ten- or twelve-year education, whichever the case may be. All types of secondary schools are socially equal and provide equal job opportunities. The professional (vocational) component of secondary school education retains its importance in the selection of individual careers.

The ten-year education, which all young people will acquire by completing the basic school plus two years of secondary school, is the

basis for attaining twelve-year education through one of the types of secondary school. The ten-year education also provides sufficient qualifications for employment in less demanding occupations.

Secondary education may be reached through any of the four-year grammar or vocational schools, or through special courses following two- or three-year apprenticeships. Two to three-year apprenticeships are regarded as a kind of middle school in the structure of manual occupations which are traditionally filled by less skilled workers. Their number will decline as more and more people take advantage of the special study courses set up alongside the currently established secondary vocational schools. Completing these provides full secondary education for manual workers who, at the same time, will form a reserve of qualified personnel for future requirements and will raise the educational level of workers as a whole.

The new concept removes the closed aspect of secondary and university education, post-secondary and post-graduate studies are open to everyone.

The third important aspect of the new education system is that it offers perspectives to large numbers. This is achieved mainly through the middle stage, where vocational courses are taken as a part of secondary education, thus bringing into the system the young working people.⁽¹⁾ These courses comprise various forms of preparation for skilled occupations and extend to general and polytechnical education. Thus theory and practice are combined. The courses are based on co-operation with industry and services and their make-up provides the ability to respond flexibly to changes in social demand. Flexibility in the response to demand is also fostered by the other types of secondary schools - grammar and technical. Students in general are educated in the specialised fields as well as in broadly based profiles in order to be able to respond to the changes in demand.

Perspectives offered by the new educational structure allow for further development by gradual planned changes, ensuring smooth transition. The establishment of twelve year general education will prepare school leavers both for the broadest field of vocations and for entering further education - a fulfilment of one of the conditions of advanced socialist society.

(1) The reconstruction of the Czechoslovak educational system is being carried out over a twelve year period and will be completed in 1986.

II. SPECIALISED AND TECHNICAL EDUCATION - AN INTEGRAL PART OF THE EDUCATIONAL SYSTEM

Specialised and technical subjects are present at all levels of the educational system but are of special importance in the secondary vocational schools and secondary technical schools.

Pre-school establishments and the basic school

In pre-school establishments, which represent the first link in the educational system and provide education to children from pre-school age to the age of six, children are acquainted with many aspects of science and technology. Apart from the time spent on physical education, intellectual training, aesthetic and music education, road sense training, selected paramilitary exercises and language learning, these establishments teach the first mathematical notions, (for instance by handling concrete objects and in playtime) and elementary mathematical concepts are formed. Here, children are also taught to observe nature, technology and receive their first lessons on the importance of work.

At basic school level in the 10 years of compulsory school, the students receive intellectual training, they form their world opinion on the basis of the ideological and political education. They are taught concepts of patriotism, proletarian internationalism, moral education, aesthetic, physical and paramilitary skills, basic allround polytechnical subjects and their discipline is also developed.

At the first (elementary) level of the basic school (grades 1-4) the pupils acquire the basic educational skills (reading, writing, arithmetic). They gain the basic knowledge about nature and society, the basic working processes, among them the importance of collective co-operation and the purpose of the division of labour. The pupil's logical thinking is developed in lessons of mathematics and the mother tongue. The basic knowledge about life in nature and in society are gained in general science subjects designed to foster comprehension of the elementary laws and relations as early as possible.

The second level (grades 5-8) continues with the same aims in mind. After completing the eight years, the young person has an open option to continue in one of the three types of secondary schools: vocational, grammar and technical. At this level of the basic school, the pupils become accustomed to more demanding work and are introduced

to new subjects. The focus of educational work at this stage is the development of active participation and of creativity. It is designed to develop logical thinking, to stretch intellectual abilities and to develop practical application. The preparation of pupils from the 1st level of the basic school in general science, and the knowledge acquired in the other subjects are broadened at the 2nd level by the introduction of new subjects in the social and natural sciences.

A significant feature of the educational content of the basic school is its orientation on the life of society in the broadest sense of the word.

Thus, for instance, the content of the courses emphasises language education as the means of communication between members of one nation and between nations. Lessons of the mother tongue emphasise the development of vocabulary, logical thinking and expression. Lessons in literature are aimed at teaching the pupil to read correctly, fluently and with understanding of the written text, to develop correct speech habits as well as to acquaint the pupil with ideologically and culturally suitable examples of national and foreign literature.

A significant role in the basic school is attributed to the social sciences, which place the present into historical context of progressive traditions, establishing understanding of the socialist social system and influence the emotional character of the pupils who are constantly forming their taste and cultural interests, and their socialist life style in general.

A significant part of the basic school curricula are the polytechnical subjects. The mastering of mathematics and other natural sciences becomes the basis of understanding the progress of science on a world scale, understanding of economic life, inter-personal relations and the process of production, distribution and consumption, i.e. all the basic concepts of technical and economic knowledge in general.

All subjects emphasise the development of physical and intellectual abilities of the pupils, the moral qualities and decision-making abilities of the pupils' personality which prepare them for work, for the defence of their homeland and for a purposeful use of leisure.

More specialised and technical knowledge may be gained from the many optional subjects which are taken up according to the students'

aptitudes and interests. The same is true of hobby groups and other activities which serve to meet the special interests of pupils.

A significant component of education in the basic school is a career guidance so that the pupil's aptitudes are developed for themselves and in harmony with the needs of society. The system of career guidance consists of career counsellors in the schools, and of district and regional pedagogical and psychological guidance centres. The school careers counsellor is specially trained for providing information for assessing aptitudes and for co-ordination supply with the demand. To develop career interests of the pupils is the task of all teachers, methodically guided by the careers counsellor.

In the overall concept of the educational process in the basic school, scientific and technical subjects have an irreplaceable position. Successful teaching of these subjects is to a considerable extent dependent on the quality of the demanding work of the teacher. His work stimulates, extends and gives a direction to creative and independent work of the pupil. In the course of school work, the pupil acquires new knowledge and new skills and uses to the full his experience, his previously acquired knowledge and information. His ability to work independently, to take independent decisions, to evaluate to logically classify and choose correct methods and procedures is developed.

It is assumed that educational methods are constantly improved, that the dialectical connection between the individual and the collective is implemented, that the pupils' work is continually assessed and that textbooks and teaching aids are perfected. Textbooks and teaching aids should provide maximum opportunities for the pupil to work independently in the individual stages of the cognitive process. They should inspire correct responses and should provide the pupil with the opportunity to apply acquired knowledge in new situations.

Five days a week at the 1st level of the basic school comprises 21.1 per cent mathematics, work practice 4.5 per cent, language teaching 42.2 per cent, 11.1 per cent music and art and 8.9 per cent physical education.

At the 2nd level of the basic school, the five day work week is distributed as follows: languages 26.7 per cent, social sciences 9.5 per cent, mathematics and natural sciences 38.8 per cent, art and music education 7.8 per cent, work practice 6.9 per cent and physical education 6.9 per cent.

Table 1. Curriculum of basic school (in periods per week)

Subject	Year								Total
	1	2	3	4	5	6	7	8	
Mother tongue and literature	9	9	9	9	5	5	4	4	54
Russian	-	-	-	-	4	3	3	3	13
General science	2	2	-	-	-	-	-	-	4
National history	-	-	1	2	-	-	-	-	3
History	-	-	-	-	2	2	2	2	8
Civics	-	-	-	-	-	1	1	1	3
Geography	-	-	-	-	2	2	1	2	7
Mathematics	4	5	5	5	5	5	5	5 ¹	39
Natural science	-	-	2	2	-	-	-	-	4
Biology	-	-	-	-	2	2	2	2	8
Physics	-	-	-	-	-	2	2	2	6
Chemistry	-	-	-	-	-	-	2	2	4
Music and singing	1	1	1	1	1	1	1	-	7
Art	1	1	2	2	2	2	1	1	12
Caligraphy ²	-	1	1	-	-	-	-	-	2
Work practice	1	1	1	1	2	2	2	2	12
Physical education and sport	2	2	2	2	2	2	2	2	16
Optional subject ³	-	-	-	-	-	-	2	2	4
Total	20	22	24	24	27	29	30	30	206

Notes: ¹Of this 1 period is devoted to technical drawing,

²In the first grade, caligraphy is taught within the lessons of the mother tongue

³Foreign languages, other than Russian conversation Russian lessons, fundamentals of technology, chemical and biological practice, mathematical and physical practice, physicochemical practice.

(contd.) Table 1.

Subject	Year								Total
	1	2	3	4	5	6	7	8	
Non-compulsory optional subjects ¹	1	1	1	1	2	2	2	2	12
Hobby groups	-	-	2	2	2	2	2	2	12

¹ Non-compulsory optional subjects in the 5th-8th grades: Practice in the mother tongue, Russian conversation, foreign language, practice in mathematics, practice in mathematics and physics, practice in physics and chemistry, practice in chemistry and biology, choir singing, musical instruments, calisthenics and singing, art, technical practice, home economics, sports and games.

Subjects directly relevant to specialised and technical education of the individual in the basic school may be characterized briefly as follows:

Primary education in the 1st and 2nd year follows on the information provided by creches and nursery schools. Children are taught how to evaluate certain phenomena in nature and society, to take note of some independently, to understand simple relations between them, to handle simple and locally accessible objects of nature and documents about social life and to name objects correctly, to describe them in simple terms. The diversity of primary teaching significantly contributes to the development of logical thinking and accurate expression.

In the 1st year the teacher organises the observation of changes in the life of people, animals and plants throughout the seasons. In the 2nd year, a more comprehensive image of nature and society in the local area of the school is evoked on the basis of selected subject areas.

Primary education encourages active participation in the class work as the best method for acquiring new knowledge and skills. The pupils learn to work independently and to care for their own well being. Mathematics gives to pupils such knowledge and skill which they will be able to use later in their occupation where the solution of many practical problems is called for and/or in further studies.

In the first year of the basic school, mathematics enables all children, according to ability to acquire basic mathematical knowledge and develop gradually mathematical thinking; they learn natural numbers

and numerical operations with natural numbers, variables in connection with the solution of simple equations and inequalities and some understanding of spatial configurations.

In the second year of the basic school the pupils' acquire the knowledge of the rational numbers and operations with them, skills in numerical counting and in the use of simple means of computation techniques. Mathematics develops the pupil's ability to read a mathematical text with comprehension, ability to generalize, to abstract and to apply acquired knowledge and skills in solving practical problems. Practical work is selected so as to meet the requirements of polytechnical education.

Considerable attention is devoted to technical drawing which is taught as a part of mathematics and geometry. The pupils learn to draw geometrical figures accurately, they can handle configurations in two and three dimensional projections as well as other skills of technical drawing.

In the second year of the basic school, their skills in numerical counting and in handling simple means of computer technology are improved. New material is function analysis and work with rational numbers teaches the easiest fundamentals of statistics and of the theory of probability.

Natural sciences subject provides the pupil with elementary knowledge in physics, chemistry, biology and other natural sciences. Teaching is organised in such a way that it allows the pupils to comprehend the basic relations and changes in nature. The pupil is led to the dialectical and materialistic concept of the world and to conscious care of the environment and of man's health. He is taught the basic skills in observing nature, he is encouraged to think, observe, measure, compare and investigate.

As the pupils come into direct contact with nature the polytechnical aspect can be ideally exploited in the natural science lessons. It is important to present knowledge in a logical structure, in correct relations and not in isolation.

Biology is taught to provide the basic knowledge of animate and inanimate nature and of the laws of its development. Apart from selected information on the physical structure, life and natural systems of plants and animals, they will receive basic information on the anatomy and physiology of man, presented with special regard to the principles of

individual and social care of health (personal, general and work hygiene, health education). The subject also encompasses geology - basic knowledge of the origins and development of the Earth, especially the Earth's crust, its structure, mineral and raw material wealth and the relation to the hydrosphere, the atmosphere and the biosphere.

This subject, as against the previous concept of biology, is based on the evolutionary theory, taught at the preceding level in the natural science subject. In the newly conceived content of the subject the number of nature objects is limited and the lessons are designed to develop working skills which will allow the pupils to make use of recommended literature, non-book teaching aids, atlases, etc. The lessons motivate pupils to engage in out-of-school activities connected with natural science and to stimulate interest in agriculture and other socially important activities which are related to the use of natural resources. On the basis of the principles of biological sciences, the pupils are able to study genetics, the variability of organisms, their inter-relations and interactions and their dependence on the environment.

Physics allows the pupils to become acquainted with the principles, laws and elements of physical theories known to contemporary physics. They become aware of physical laws in everyday life and in important technical equipment and installations. Independent solution of problems helps develop the understanding of physics. Experimental activities teach skill and aptitudes so important in the polytechnical thinking. They are taught to think scientifically.

They become acquainted with the structure and properties of substances, the fundamentals of mechanics, optics, electrical engineering, magnetism, they form the ability of concrete thinking in the application of physical laws, and thus understand the principles of power production, transport, communications, engineering and the building industries. They learn to use SI units, especially the joule and the newton. The importance of interdisciplinary relations between physics and mathematics, chemistry and work practice is constantly stressed, especially common laws and common terminology.

The aim of chemistry is to give to the pupils the basic knowledge about chemical substances, chemical processes and chemical laws. Using examples of production processes and selected examples from applied chemistry, the pupils will become familiar with the importance of chemistry

and the chemical industry in the economy and in everyday life. The student progresses from the particular to the general and develops logical thinking necessary in the understanding of other chemical problems. The pupil will learn how to handle chemicals and chemical instruments and apparatus, he will learn simple chemical experiments and will learn to determine selected chemical substances. He will also be preparing for further specialized study, for work in production, and for practical life. The pupils are led to become aware of their responsibility, they learn to keep their things in order, to observe safety at work and they learn the basic principles of environmental control in relation to chemistry.

In work education and practice, students develop positive attitude to work, they acquire basic production and technical knowledge and skills, they learn to develop a positive and creative attitude to work.

In the first 4 years of the basic school work practice is confined to very basic skills in work with various materials and in plant growing. They learn to distinguish material and tools, they learn to respect the requirements of work safety and hygiene.

In the second four year cycle, work practice may be done in school workshops where the pupils learn technical drawing, gardening and plant growing and homecraft for the girls; emphasis is again put on the pupils' conscious, creative and independent work.

The content and organization of work practice is adapted to suit the local conditions of the school. In the lessons the teacher will emphasise the polytechnical aspect of the subject, the interdisciplinary relations between the social and the production aspect and the importance of positive attitude to work.

Students who show special ability in specialised and technical subjects select another optional subject in the same line: production processes, biological and chemical practice, mathematical and physical practice, physical and chemical practice. In the optional subjects the pupils develop their specific interests, abilities, inclinations and talents which will facilitate their choice of vocation or of further education.

Grammar schools

The grammar school is conceived as a general and polytechnical institution of secondary education, designed to provide broad knowledge and to envoke harmonious development of the young people. The majority of grammar school leavers enter higher education, the rest for job careers.

The dual function of the grammar school is justified by the immediate and prospective needs of the socialist society which requires an increasing number of specialist and skilled workers with higher education.

The dual role of the grammar school must correspond with the following criteria:

- (a) broadly varied content of the courses as a preparation for university education;
- (b) the increasingly demanding character of social activities, especially production;
- (c) natural occurence of the widest variety of talents among the adolescent youth.

The grammar school leaver is prepared for higher education, and for employment by having acquired specialised theoretical and practical education and training which make him suitable for many jobs in production and other sector of the national economy which place increased demands on intellectual abilities, (E.g., semi-automated and fully automated production processes).

The graduate of the grammar school is characterized by ideological and political maturity, by having acquired polytechnical knowledge at depth by his ability to apply these qualities in social activities and in production. He will have a high level of intellectual capabilities and skills that enable him to manage and organise in the given field. The depth of his theoretical knowledge allows him to abstract, analyse and generalize social and natural phenomena and to understand their causality. By developing individual methods of independent work for acquiring new knowledge and in tackling successfully problematic tasks, the grammar school student acquires a foundation for scientific research. As the knowledge gained is skill selected, the grammar school student feels the need for continuous education. Mastering two foreign languages is an asset in employment as well as for enrolment in higher education.

The grammar school leaver is a highly ethical person, influenced by scientific materialism and is active in society outside school as well as in social activities of the school. Among the positive attitudes the graduate shows is his application to work first at school, then in productive activities.

The new content of the grammar school courses is characterized by the updating of general subjects, by the deepening of the polytechnical aspect of instruction and by the introduction of technical and scientific subjects. The structure safeguards an adequate coverage of the humanities, of mathematical and natural science subjects and of technical and economic subjects.

The new concept eliminates difficulties connected with the practical deployment of grammar school leavers, by giving them a legally recognized educational qualification. Thus the grammar school leaver who does not intend to enrol at an institution of higher education is qualified for the following careers:

- specialised work in the field of planning, finance and distribution,
- processing searches from technical and specialized literature, compilation of production, technical and economic information,
- collection of data for standardization, compilation and verification of standards,
- preparation of background information for investment planning; evaluation of reports and compilation of statistics,
- compiling and evaluating individual sections of the economic plan,
- work in the field of finance and book-keeping, sales promotion, organization, distribution, publicity and advertizing,
- work in the field of fire protection, safety regulations, transport planning,
- control and administration of production testing,
- processing background information material for construction work for introduction of new technologies or new products,
- collecting data used for establishing pricing policy,
- work in the field of research and experiments in complex rationalization,
- work in laboratories, as translators, interpreters, programmers, operators, etc.

However, one of the decisive features of grammar school education is the emphasis on general knowledge.

The other decisive feature is the polytechnical aspect of grammar school education.

Preparedness for jobs in production is achieved by close contact with practical life through involving pupils in the daily routine in enterprises, factories and institutions during the summer holidays for two weeks after the second and third years of study; organizing voluntary work, developing facilities for various types of hobbies, especially those of a technical stand, and other out-of-school activities.

The specialised and technical aspect of grammar school education is linked to the broadly general polytechnical subjects and to the practical appreciations during job practice.

The unity of theoretical and practical components of education in the grammar school is inherent in - the system of informative and formative facts and relations in the field of natural sciences, social sciences and technical sciences, designed to safeguard systematic mental development, especially the development of functional operative thinking; - the acquisition of the basic approaches and strategies necessary in the acquiring of the knowledge of objective reality, - the familiarising with methods of effective study and self-education, - extending theoretical knowledge of phenomena, processes and laws of objective reality with regard to their application, - the introduction of the polytechnical aspects especially in the natural sciences, - instruction in the fundamentals of production and specialist training, - systematic implementation of laboratory and practical experiments, especially in natural science and other specialized subjects.

Very gifted students are given the possibility to study and sit for examinations earlier which allows them to advance to higher education in a shorter period of time.

Technical and scientific instruction in grammar schools is present to a lesser extent than in the secondary technical schools and secondary vocational schools. Having the presence of polytechnical education and the job orientation at some subjects in the grammar school creates pre-conditions for flexible adaptability and social mobility in the changing conditions of the economy. Their presence also complies with the aim of

the grammar school to produce graduates to enter university education in the scientific and technical subjects.

Table 2. Curriculum of Grammar School (periods per week)

Subject	Year				Total
	1	2	3	4	
Mother tongue (grammar and literature)	3	3	3	3	12
Russian	3	3	3	3	12
Second foreign language (English, French, German, Spanish)	3	3	3	3	12
Civics	-	-	2	2	4
History	2	2	2	-	6
Geography	2	2	-	-	4
Mathematics ¹	4	5	4	4	17
Physics ¹	3	3	3	3	12
Chemistry ²	3	3	3	-	9
Biology ^{2/3}	3	3	3	-	9
Fundamentals of cybernetics	-	-	-	2	2
Physical education and sport	2	2	2	2	8
Paramilitary education	1	1	-	-	2
Additional subjects of student's choice	-	-	-	3	3
	31	32	32	31	126
Optional subjects	2	2	2	2	8

Note: ¹The class may be divided into two groups for one period a week

²One period a week is set aside for practical exercises

³Geology is taught in the first semester of 1st year

⁴Providing the conditions of the school make it possible the number of periods may be increased to 3 per week.

Additional subjects of a specialized orientation are: fundamentals of engineering, fundamentals of electrical engineering, fundamentals of chemical technology, fundamentals of construction fundamentals of agricultural production, programming and the operation of computers, fundamentals of economics.

According to the regional needs and school facilities other groups of additional subjects may be introduced.

In the 4th year of grammar school the following additional subjects may be taken seminar and exercises in mathematics, seminar and exercises in physics, seminar and exercises in chemistry, seminar and exercises in biology, seminars in literature, linguistics, history, geography, social science, psychology, the fundamentals of pedagogy, aesthetics, conversation and reading in Russian or in another foreign language, planimetry, fundamentals of the automated production control, etc.

As concerns optional subjects the pupil can choose a maximum of two; three if one of them are games. The following subjects are optional in the 1st-4th years of grammar school: a two year course in planimetry⁽¹⁾, a two year course in technical drawing⁽¹⁾, exercises in mathematics, physics, chemistry, biology, technical creativity, another foreign language⁽²⁾, conversation in a foreign language, Latin (a two to four year course), history of culture - science, art, technical development (2 year course), driving school, fundamentals of administration, home economics (sewing, nutrition, child care - a two year course), music (two year course), art (two year course), recital, games and sports.

The scientific and technical profile is given by mathematics, physics, chemistry, biology, the fundamentals of production, or specialist training.

The new concept of teaching mathematics is characterized by greater emphasis on the theory of sets, on the logical and structural concept and on the introduction of such areas which are important for application. New methods are focused on the application of knowledge and structural comprehension of recurring sets, of numerical operations, on the solution of equations and inequalities, on the study of elementary functions and the foundations of differential and integral calculus, on the fundamentals of plane and solid geometry, analytical vector geometry, on the mathematical fundamentals of computer technology, on the study of those parts of

¹Associating pupils of different grades to complete a comprehensive course

²Another foreign language than is the compulsory foreign language.

mathematics which are important for application in different fields, such as mathematical statistics, on the combinatorics and the theory of probability, on linear programming, on fundamentals of the theory of graphs and games.

The new concept of teaching physics is characterized by the formation of logical structures of knowledge and their consistent differentiation. Next to the basic knowledge of classical disciplines mechanics, hydromechanics, the theory of thermal processes, vibrations and wave motion, electromagnetism, optics, nuclear physics and astronomy the pupils become acquainted with the elements of modern physics - statics, quantum physics, theory of relativity, physics of rigid fibres, astrophysics.

The new concept of teaching chemistry includes instruction in general and physical chemistry which enables the student to comprehend the wave-mechanical model of the atom, chemical bonds, reaction kinetics, thermochemistry and thermodynamics, the states of substances, properties of chemical reactions, the theory of acids and bases, reduction processes, environmental studies and the principles of work safety.

According to the new concept of biology teaching, botany, zoology, human biology and general biology are no longer taught as independent subjects. The main emphasis is placed on general biology which by its content, synthetic character and philosophical impact has basic importance for general education and for the assessing of science on a world scale. Lessons include information on the material substance of life, the cell, the origins and development of life with special emphasis on the most modern fields of biology, i.e., nutrition, energy regime and metabolism, molecular biology, genetics and ecology. Modern biology teaching also includes information on the human organism, its development and control, on the problems of the development of the human population, health care, on the biological foundations of the family, on the interactions between man and the environment and the philosophical implications of this knowledge.

New methods in the teaching of geology reveal the inter-relations and laws in inanimate nature and concentrate on the use of the acquired knowledge in practice.

The subject "Fundamentals of production and specialty of training" makes up 12.5 per cent of the total curriculum. This subject is taught in the first two years of grammar school and may be continued for another

two year period as an additional subject. This subject broadens and deepens the polytechnical aspect of grammar school education. By adding technical training, it improves the preparation of students for technically-oriented higher education or provides the student with the foundations of specialized training as the recognized qualification for certain occupations. Lessons in this subject are complemented by the practice in enterprises.

The conduct of lessons in this subject follows on practical training taught in the basic school, and on the natural science subjects. It provides the students with a technical orientation, with knowledge and skills in sciences which are applied in production, its organization and management. It represents the linkage between school and life, and the pupils are thus directly involved in productive work.

Fundamentals of production and specialist training is taught in general terms in the first two years of grammar school and as three specialized subjects in the third and fourth years. The pupil chooses one or more according to need, according to the facilities at the school and according to the student's personal interest. The range of the subjects includes: engineering, electrical engineering, chemical technology, building, agriculture, computer technology, foundations of economics. In some areas, the following subjects are available, too: social welfare, law, transport and communications, tourism, etc.

With regard to the future prospects of the development of secondary education the grammar school will continue to emphasize the functional aspect which will permit deeper integration at the three types of secondary schools.

Secondary technical schools and secondary vocational schools

In the first part of this study which characterized the concept of the development of the Czechoslovak educational system it was emphasised that conditions are being created for the majority of young people to be provided with full secondary school education in a twelve year cycle. The necessity for full secondary education is dictated by the changes in society, in the democratic development of the social structure of Czechoslovakia. These changes demand further democratization of education at secondary school level. Therefore, within the framework of the development of the Czechoslovak educational system, individual types of secondary schools are being brought closer together.

The content and organization of the secondary vocational schools proceed from social needs, from the development of the work process in worker occupations. Facilities are also provided for out-of-school activities.

Vocational school prepares the pupils for skilled work and develops abilities, knowledge and aptitudes adequate for the current production processes. The main aim is to educate the students of these schools in such a manner which would make them capable of keeping up with the changing character of skilled work. Graduates of these schools will be able to perform duties in production control.

Secondary vocational schools teach the general polytechnical and specialised subjects in an organic unity. The fact that this type of polytechnical education is put on the level with the education provided by other types of secondary schools, (grammar and technical) gives the young workers the opportunity for further education.

A characteristic feature of the specialised education provided at vocational schools is that it prepares the graduate for adaptation to new requirements and changes in production processes. The breadth of training will facilitate easy performance of activities in different sectors of production. Mastering the fundamentals as individual technologies will lead to mastering a whole range of operations. A considerable proportion of theoretical knowledge is directed towards the understanding of scientific and technical development of a given field as well as to understanding elements that are common to all technologies.

Secondary vocational schools provide:

- full secondary school education in four year courses
- secondary education in two and three year courses.

Students finishing the two or three year courses may attain full secondary education through special courses provided by secondary vocational schools.

The graduate of a secondary vocational school is qualified for the performance of skilled worker occupations.

Whether a specialisation demands a two, three or four year study is decided according to the type of occupation and by the forecasts for their future development.

Apart from the system of vocational schools, there are study courses which allow the worker to continue in education - to complete the whole twelve year cycle.

A Decision taken by the Central Committee of the Communist Party of Czechoslovakia in 1976 confirms the development launched in 1973 and extends the field of establishments for vocational training. The aims of this decision is to:

- Place apprenticeship on the level of studentship;
- the curricula of specialized training in the first year of vocational school are developed so as to correspond with the age of the pupils (14 years);
- after leaving school, the youngsters are given jobs which can be performed by them easily (not jobs suitable for adults only).
- the subject matter studied in the first two years is similar to the subject studied in the other types of secondary schools, so that in certain cases pupils of the first two years of vocational schools may change to other secondary schools;
- education and teaching is conducted exclusively in special educational establishments - secondary vocational schools.

The establishing of the system of secondary vocational schools was brought about mainly by the fact that the changes in the character, division of labour and the work process result in significant shifts in the qualification structures of the workers and in the structure of society as a whole. The differences between individual vocational categories of the working people, i.e., class barriers, are gradually eliminated. The traditionally intellectual occupation demand a shift towards the technical and manual occupations demand more and more intellectual application. One of the forms by which the socialist educational system responds to this situation is to devise such a system of education which would speed up these changes rather than hinder them. Secondary education plays an important part when it puts the three types of schools grammar schools, technical and vocational on an equal level.

Secondary vocational schools provide the worker with general polytechnical education, and equip him with knowledge necessary for continuation in higher education.

workers in the individual sectors. Numerous measures were taken which created conditions for raising the educational level of working youth. Thus specialised training began to meet the demands of industrial production. A new law was passed referring to vocational education. The specialisations were listed and teaching courses coupled with new methodology were established.

It may generally be said that since 1945, and especially since 1948, the training of working youth was gradually improved in compliance with the development of the whole Czechoslovak educational system. An important milestone for the acceleration of this process was the Decision taken by the XIVth Congress of the Communist Party of Czechoslovakia which set the task of further improving the quality of the specialized and ideological education of apprentices. The content and organisation of the new education was approved in 1973.

The focus of the adopted amendments lies in the improvement of the quality of instruction and of the quality of teaching establishments.

1. General educational subjects taught at the other types of secondary schools are introduced into the vocational courses. The subject matter follows on the curriculum of the final year of the basic school. Thus the working youth is better prepared for their own jobs whilst they also gain knowledge which would enable them to continue in education.

2. In compliance with the demands of the socialist society to raise the general level of education, an increasing number of working youths complete secondary education and enter tertiary education with the same qualifications as those obtained in the other types of secondary schools. All this in response to the changing demands of the economy and to changes in the living standard of society.

3. The content of the specialized training also changes. A new system of vocational courses has been established, in accordance with the needs and demands of the development of the economy. On the basis of forecasts of technical improvement in industry existing apprenticeships are being extended by new branches. All courses have common grounding; at a later stage, they branch out into individual narrow specialisations (e.g. engineering.)

- (i) The training of apprentices was concentrated mainly in the workshops of craftsmen and artisans and was therefore limited.
- (ii) There was no adequate social interest to extend apprentices education.
- (iii) The training of apprentices lagged behind the needs of industrial production.

Up to the year 1948 vocational training was not considered equal to the other forms of secondary education. Since 1948 with the establishment of a socialist Czechoslovakia, vocational education was included in the national education system.

In 1950, centres for working youth were established at large enterprises. Training of apprentices was provided by the enterprises in workshops built specially for this purpose. Work was started on the development of curricula for specialized vocational training.

The rapid economic development of socialist Czechoslovakia, however, required increasing numbers of skilled workers. The planned management of labour deployment was introduced and the indispensability of building an organization of apprentice training centres and schools which would secure the training of qualified workers for the individual branches of the national economy became evident. In 1951, the system of skilled labour reserve for key branches of the national economy was established. The labour reserve was extremely important in that methods of training were devised for it. They could be used later as a basis of curricula in the newly conceived vocational schools.

The system of labour reserve characterized by the broad network of apprentice centres and schools for the training of youth for worker occupations had its shortcomings, too. The system began to lag behind the needs of the national economy. The fact that this system was designed only for key branches of the national economy meant that young people also attended apprentice schools and held various jobs. These three separate aspects did not meet the requirements of the developing national economy.

For all these reasons the system of labour reserves was abolished in 1957 and it was decided that each individual sector would be responsible for the training of its apprentices.

The Ministry of Education was authorized to organize, ideologically and methodologically control, co-ordinate and direct the training of young

and experience. They take into consideration the objective reality of our time and the demands of advanced socialist society on the qualifications of workers.

Let us take a brief look at the history of this progressive type of education. The educational system in the Czechoslovak Socialist Republic has a tradition of many centuries¹ which enables it to respond to the developments of modern society. The system of socialist education designed to provide for an allround development of the young generation is based on these traditions.

The history of specialised middle schools has a tradition of more than 250 years; the organized training for workers vocations has a tradition of more than a century long. The development undergone by organized training for worker occupations reflects the individual political and economic stages in the development of the country. First the period of the development of capitalism in the Austro-Hungarian Empire where the principal concern was to employ cheap skilled labour. Then the first independent bourgeois Czechoslovak State, in which the training for worker occupations, i.e., apprentice training, was oriented according to the requirements of private enterprise without any unified continuity with school education. Then the period of the Nazi occupation of the country during the second world war and finally the first years immediately after the war when the progressive trends in this field came into conflict with the retarding interests of the non-progressive strata of society.

The very history of specialized training of skilled workers began in the feudal period, namely in the 14th century, when the first records appear on the training of apprentices in guild regulations preserved in the town archives. The development of industrial production in the early 17th century resulted in a new situation. In 1739, Emperor Charles VI issued the "General Articles" which for the first time incorporated and institutionalized the apprenticeship period; in 1770, factories were given the permission to train apprentices. In the 18th century, certain definite forms of training youth for worker occupations were established. However, up to the establishment of a socialist Czechoslovakia, the training of youth for worker occupations was confined to:

¹E.G., Comenius the great Czech. educator (16-17th centuries) created the basis for an educational system for all people and laid a basis for further development. His ideas of "the general education for all who were born as human beings for all that is human" are valid even today.

Table 4. Ratio of periods of individual subjects

Groups of subjects	Ratio
Social sciences and languages	20-24 per cent
Mathematics and natural sciences	14-17 per cent
Physical, sports and paramilitary ed.	9 per cent
General education (basic)	43-50 per cent
General technical	23-33 per cent
(of this laboratory and practical training)	(7-10 per cent)
Special	24-34 per cent
(of this training in the workshop, practical training and practice)	(10-20 per cent)
Specialised	50-57 per cent

The survey shows that the content of secondary technical schools consists of two components: the general polytechnical knowledge and the specialised theoretical and practical knowledge.

The component of polytechnical knowledge consists of a group of social sciences subjects and languages (the mother tongue - grammar and literature - Russian, possibly a second foreign language, history, civics), the group of mathematical and natural science subjects (mathematics, physics, possibly chemistry and biology) and physical education and sports and paramilitary training.

The component of specialised knowledge consists of a group of general technical subjects (in the technical streams this will be, for instance, mechanics, engineering drawing, economics, etc., in the economics stream geodesy, botany, zoology, etc.), and a group of specialised subjects providing the students with up-to-date and concrete knowledge of the given specialisation.

B. Secondary vocational schools are designed for the specialized and technical education of basic school leavers who are being trained for worker occupations. They are an extension of the system of workers education and apprentice training centres and are based on long tradition

Table 3. Models of standard curricula

	Broader operation and technical streams				Broader streams (e.g. economics)				Narrower streams (e.g. agriculture)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
Mother tongue (grammar and literature)	2	2	2	2	2	3	3	2	2	2	2	2
Russian	2	2	2	2	2	2	2	2	2	2	2	2
Second foreign language ²	3	3	2	2	3	3	2	2	3	3	2	2
Civics	1	1	1	1	1	1	1	1	1	1	1	1
History	2	2	-	-	2	2	-	-	2	2	-	-
Mathematics	4	4	2	2	3	3	2	2	4	3	2	2
Physics	4	-	-	-	2	2	-	-	2	2	-	-
Chemistry	2	2	-	-	3	-	-	-	5	4	-	-
Physical education and sport	2	2	2	2	2	2	2	2	2	2	2	2
Paramilitary education	1	1	-	-	1	1	-	-	1	1	-	-
General technical subjects	6	10	10	5	6	8	12	7	4	5	8	6
Special subjects	4	4	12 ¹	16 ¹	5	5	8 ¹	12 ¹	3	4	12 ¹	13 ¹
Total	33	33	33	32	32	32	32	30	31	31	31	30
Optional subjects	2	2	2	2	2	2	2	2	2	2	2	2

Note: ¹ partly optional

² optional or compulsory (usually German, English or French)

- practical examples are used widely in order to illustrate the theoretical side in such a manner as to give the graduate a profound understanding on the economic phenomena and economic laws;
- the study includes management training.

Agricultural schools concentrate on

- theoretical knowledge of nature laws as the basis for large-scale agriculture. The polytechnical orientation is emphasised in the teaching of the natural science subjects and by the study of the design and operational properties of technical equipment;
- on the connection with the use of chemicals in agricultural production. Emphasis is given to the knowledge of the effects of chemicals on cultural plants, farm animals and animal products, on man and on the environment;
- the economy of agricultural;
- in special subjects, emphasis is given to rational organization of production and to the application of industrial methods in agriculture;
- legal education as relevant to agriculture;
- practical skills necessary for the handling of complicated equipments and for the control of production processes in agriculture.

It is assumed that each individual skill can be perfected only after leaving school in actual production. These relatively more permanent skills will make the school leaver more adaptable to job changing.

On-the-job training within the framework of the study course will serve as a link between the secondary school and production. Specialised schools themselves bear the characteristic of the job they are designed for and include technical, agricultural, forestry, nursing and health care, teacher training, applied arts and conservatories.

We give an example of the technical, economics and agricultural schools: Technical study streams: engineering, electrical engineering:

- from the general subjects mathematics and natural sciences with polytechnical orientation, providing a theoretical basis of technical training, prevail;
- language teaching is part of both general and specialized education;
- social sciences are taught with the aim to provide the student with basic psychological and sociological knowledge needed for successful integration in a work collective and in management.
- in the specialised subjects, main attention is focused on complex mechanization, automation and cybernetics which have a revolutionary impact on production, on energy, working operations and the utility value of the end product.

Economics schools

Out of the general subjects social sciences and languages prevail over natural sciences subjects;

- Marxist political economy is the theoretical basis of this course;
- language teaching is extended as part of the general and of the specialized knowledge (the active mastery of the Russian language and the knowledge of at least one other world language is required);
- mathematical knowledge is strengthened and brought up-to-date concentrating on the application in economics and in the introduction and operation of modern computers;
- natural science subjects provide the polytechnical knowledge;
- the courses concentrate to a great extent on understanding processes within an enterprise and their effect and influence on the national economy and on the international scene;

Fundamentals of the specialised subjects are the backbone of these types of schools. The pupils acquire knowledge of the substances of phenomena of the principles and laws underlying them and of technical, technological, structural, economic and social relations. They acquire basic skills for applying this knowledge in solving typical situations and problems. Some subjects may be common to different groups of related study fields. Varied methods are used in order to stimulate intellectual abilities of the pupils and their individual dispositions and interests. These subjects are fulfilling the aim of providing polytechnical education.

3. Individual specialized subjects provide the pupil mainly with concrete and specialized knowledge and skills for practical engagement in future jobs. It is emphasised that these subjects should provide the pupil with concrete and up-to-date specialized knowledge and skills indispensable for their employment. As they are open to people already in employment, the courses are flexible and correspond with the demands of each individual specialisation. This is valid also in relation to other subjects.

Basically, individual specialized subjects provide the future workers engaged in production, transport and in the services and culture with the necessary knowledge and skills necessary for the handling of jobs. They learn the properties of new materials, design and operation of modern machines and equipment. They study technologies and new methods of increasing productivity and improving organization of work, economic aspects of production processes. The content of specialized subjects is conceived as a dynamic system which incorporates systematically current advanced knowledge and allows the leavers of each individual study course to work in new technical and technological conditions and to be able to operate in these conditions immediately on completing the study course.

4. Specialized practical subjects prepare the pupils for the performance of qualified activities. In these subjects the pupils acquire general, widely applicable skills out of which further specialised skills are developed.

The focus of training is in laboratory work and workshop training, on-the-job training and in other activities which are usually organized in purpose-built schools.

Training at secondary technical schools leads at first to controlled work experience, then to post-secondary studies and, hopefully to continuous education.

The characteristic features of technical schools are:

- unity of the theoretical and practical subjects arising from a flexible system of compulsory groups of subjects, groups of additional subjects and groups of optional subjects;
- training is conducted in laboratories and purpose built units;
- Students are prepared for practical work through the short term practice during holiday periods and through controlled period of work experience.

Specialised and technical vocational courses take up to four years of day education which follows onto the basic school, thus ensuring continuity. The courses may be attended in free time by employed persons and are open to anyone who has completed secondary education with matriculation. This way other specialised knowledge may be gained. Specialised and technical subjects may also be studied by correspondence.

The characteristic features of vocational schools are:

1. General polytechnical emphasis as in other types of secondary schools. The courses also include social science, language, mathematics, natural sciences, physical, sport and paramilitary education. As means for specialized training, the vocational courses include both theory and practice in each specialised subject.

Social sciences and language subjects are vital in stimulating intellectual ability in forming the students world opinion.

Mathematics and natural science subjects are geared to incorporate as much material as possible which is relevant to individual vocations. Information from the sphere of the humanities is added where subject matter allows it.

General subjects should adequately reflect the objective reality of life, and should be drawing from the achievements of science and technology and the economy. The whole structure is designed to give opportunity of personal development of talents.

2. The focus of specialized courses is in the general subjects appertaining to each specialisation. They are designed to broaden knowledge with the aims of fostering adaptability. Both theoretical and practical sides are stressed.

A significant characteristic of the individual types of secondary school is the fact that they are placed on a socially equal footing. They have many common tasks while retaining their certain specific functions. All three types of secondary school prepare their students for qualified work within the framework of the social reproduction process, and for further education, including universities.

Having become acquainted with the characteristic features of the grammar school we shall now turn our attention to secondary technical schools and secondary vocational schools. Both types of secondary schools are specifically oriented to providing specialized and technical education and training to youth and adults. The process of bringing closer together the individual types of secondary schools will permeate all facts of education. It will be concerned with the setting of educational goals and methods, forms and conditions for achieving them. It will be concerned with the teaching aids, with purpose-built school facilities, with the training of secondary school personnel. The process of bringing closer together all the types of secondary schools will correspond with the objective reality of social development and of social needs. The process will neither be accelerated nor retarded. For the nearest future secondary technical and secondary vocational schools will retain their irreplaceable role in the specialized and technical education of youth.

A. Secondary technical schools are a well established type, with a history of more than 250 years. Their history is linked with the development of industry on the territory of what is now the Czechoslovak Socialist Republic. Their aims is to prepare young people and adults for the performance of technical, economic, social, cultural, educational, and other similar functions of medium difficulty in all the fields and branches of the national economy and culture. In some branches they train students for highly skilled jobs.

The courses are designed so as to provide the pupils with the necessary knowledge and skills which will allow them to take up qualified jobs in the respective fields as soon as possible and to upgrade their qualification. This is attained by the broadening of study fields and by strengthening the theoretical and general knowledge. The courses include general subjects as well as the special subjects they are designed for. Changes in demand are carefully considered. The courses stress the significance of the human factor in the production process.

Table 7. Curriculum for a four year services course with final examination (full secondary school education)

Subject	Number of periods per week			
	1	2	3	4
Main medium (grammar and literature)	3	3	2	2Mp
Russian	2	2	2	2Mp
Civics	1	1	1	1
Second foreign language	2	2	2	2Mv ₁
History	2	-	-	-
Mathematics	4	3	2	3Mv ₁
Physics	2	2	-	-
Chemistry	2	2	-	-
Physical education and sport	1	1	1	1
Paramilitary education	1	1	1	1
Technical subjects - theoretical	6	9	9	SMv ₂
Subject of practical training	6	7	16	16
T o t a l	32	33	36	36

Note: Mp compulsory subject for final examination
Mv₁ elective subject for final examination (mathematics foreign language)
Mv₂ elective subject for final examination (one of two elective technical subjects)

Table 6. Curriculum for a four year production course with
final examination (full secondary school education)

Subject	Number of periods per week Year			
	1	2	3	4
Main medium (grammar and literature)	3	3	2	2Mp
Russian	2	2	2	2Mp
Civics	1	1	1	1
History	2	-	-	-
Mathematics	4	2	2	4Mv ₁
Physics(Chemistry)	2	2	2	3Mv ₁
Chemistry(Physics)	2	1	-	-
Physical education and sports	1	1	1	1
Paramilitary education	1	1	1	1
Technical subjects theoretical	8	8	9	10Mv ₂
Subjects of practical training	6	14	16	12
T o t a l	32	35	36	36
Note: Mp compulsory subject for final examination Mv₁ elective subject for final examination (mathematics or profiling natural science subject) Mv₂ elective subject for final examination (one of two vocational subjects)				

10. The necessary number of educational and other personnel, financial and material means for the operation of the vocational school are provided from the sources of organizations which are obligated to fund the costs of the preparation of workers. They are planned by the sectors and organizations administered by the sectors at such level of management and in such a scope as to secure the fulfilment of the tasks set to the vocational schools by the state plan according to the generally valid regulations.

11. The pupils are materially provided for under special regulations. In the period of basic education they receive pocket money, in the period of technical training and in the period of on-the-job training they receive remuneration for work performed (in case they have not been able to perform their work for no fault of their own they will receive pocket money). The social importance of the apprenticeship and the results which the pupil has attained in all fields of study and training will be considered.

The educational process at secondary vocational schools is organized basically according to types of curricula, selected examples of which are given in the following tables. (Tables 6-12).

As concerns the characteristics of the subjects which have been chosen for curricula at secondary vocational schools they comprise subject matter of general educational character (basic subjects), closely following on the subject matter taught in the basic school, basic technical subjects and subjects of practical training.

As concerns the general educational subjects, special attention should be devoted to physics. The specific aim of this subject is the acquisition of a thorough knowledge of basic physical phenomena and laws on which other technical subjects will follow. Furthermore we are concerned with the acquisition of basic skills in the field of measurement, the evaluation of measured variables and the handling and operation of selected laboratory apparatus.

This aim is fulfilled especially by an optional subject, such as laboratory practice in physics.

The basic technical subjects serve the acquisition of the necessary knowledge and skills which are indispensable for the formation of the student's theoretical understanding of the material side of production.

they approve the network of secondary vocational schools, the system of apprenticeships and study courses, approve the textbooks and other teaching aids and adopt the necessary measures which would secure agreement of all sectors involved in the education of pupils in secondary vocational schools.

7. Regional national committees have the authority to regulate and methodologically control the educational process in secondary vocational schools with the aim of levelling the differences between the standard of care devoted by the individual sectors and by the schools themselves to the political and vocational preparation of future workers. They see to the creation of conditions for the successful education of all basic school leavers in vocational schools, they supervise the fulfilment of regulations and execute state supervision of the education of pupils in vocational schools set up by each sector. They suggest modifications in the network of secondary vocational schools and organize the deployment of students in the schools with a purpose and economy. In co-operation with the individual sectors, they secure the fulfilment of their tasks in organizing final examinations. The regional national committees influence the work of secondary vocational schools especially by their supervision of teachers of theoretical subjects who are employees of the regional national committees. This safeguards the direct influence of the state on the whole field of theoretical education. The deployment of teachers of theoretical subjects to any concrete vocational school will be discussed by the department of education of the regional national committee with the respective vocational school.

8. Headmasters of secondary vocational schools within the authority of the individual sectors may be appointed and dismissed only after the approval of the respective regional national committee.

9. Secondary vocational schools are established and administered by the ministries and by other central authorities within whose authority the working youth (hereinafter the "sectors"), is educated or by organizations immediately subordinated to the individual sectors and regional national committees. Within the authority of the departments of education of regional national committees, such secondary vocational schools are established for which the individual sector or the regional national committee safeguards practical training. The sectors will decide which organization within their authority is the most suitable economic unit for securing the necessary conditions for the functioning of the vocational school.

2. They are designed exclusively for preparing leavers of the basic schools for skilled and similar occupations.

3. Secondary vocational schools are a part of the national education structure. They allow to a part of the basic school leavers to complete their compulsory school attendance. Here they broaden their general polytechnical education and gain qualification for the performance of a skilled occupation.

4. Numbers of plans in secondary vocational schools are safeguarded by the State Plan. The number of pupils in each individual school is finalised in agreement with the respective regional national committee.

5. Admission of pupils to any secondary vocational school and for any apprenticeship is the matter of the respective sector and the organization which it administers. These organizations recruit basic school leavers for the respective occupation. In case the legal representatives of the school leavers and the organization of the respective sector do not agree on a concrete secondary vocational school and on a concrete apprenticeship, the regional national committee will decide on a suitable secondary vocational school in which the basic school leaver will complete his/her compulsory school attendance. The decision must be in accordance with the targets of the State Plan for the deployment of the basic school leavers.

6. The Ministry of Education of the Czech Socialist Republic and the Ministry of Education of the Slovak Socialist Republic have the central function of ideological and methodological control of the education of students attending all secondary vocational schools. They implement this function through other ministries and central authorities, within whose power the secondary vocational school is set up, and through regional national committees. The two ministries of education basically organize, co-ordinate and control education in all sectors of the national economy. The ministries of education in co-operation with the other sectors process the concept of the development of secondary vocational education, they issue regulations, secure the unity and effectiveness of all components of education, publish generally valid instruction documents, set demands on the ideological, technical and pedagogical qualification of the educational personnel, publish pedagogical and organizational regulations related to the organization of instruction in these schools,

Table 5. Practical and theoretical instruction in the curriculum

	number of days in the week devoted	
	to practical training	theoretical education
<u>Three year courses</u>		
1st year	1	4
2nd year	2	3
3rd year	3	2
period of on-the-job training	5	-
<u>Two year courses</u>		
1st year	1	4
2nd year	2	3
period of on-the-job training	5	-

The preparation for skilled occupations is divided into the period of basic training and the period of vocational training. (In the case of the two- and three-year courses, another period of on-the-job training is added.)

The period of on-the-job training takes four months and is included in the last year of the course (September-December). It is devoted exclusively to practical training and safeguards the beginning of the pupil's systematic adaptation to the conditions of his future occupation. At this stage and at this age the pupils are able to fulfil demanding complex tasks under supervision. Practical training consistently follows on the knowledge which the pupils have gained in theoretical lessons. The school year is co-ordinated with the calendar year and with the planning year used in the national economy. This makes it possible for the skilled workers to take up their jobs at the start of the calendar year in which they reach the age of 17 or 18 years.

The position, organization and administration of secondary vocational schools may be specified as follows:

1. Secondary vocational schools are secondary schools within the authority of ministries or possibly other central authorities and within regional national committees.

cases where it contains elements of automation, the character of the occupation is derived from technological processes (e.g., machine operator, mechanic, maintenance worker, chemical control personnel). The content of certain occupations has a common technological basis and the individual occupations (machine operator, lathe operator, milling machine operator) only differ in demands on the special knowledge and skill. With this corresponds the organization of education in specialised study fields in which the training of a whole group of occupations may be based on one common core.

General knowledge gained in a similar way as in other secondary schools. The subjects include the mother tongue (grammar and literature), Russian, civics, history, mathematics, physical and paramilitary education, natural science subjects (physics, chemistry, possibly biology). The share of general subjects in the curriculum makes up 39-44 per cent of the total. Included in the curriculum of general subjects (25 per cent of the total) is the teaching of a special subject on which the relation between general and special may be best illustrated.

The new concept of the vocational school is characterized by the structuring of the subject matter and by the establishment of a system of specialized knowledge and skills through theory and practice. The common core of specialized knowledge and skills for a number of apprenticeships makes it possible to include many subjects which all together provide polytechnical education. This common core may be technical drawing, engineering, material science, Special subject matter is usually related to the performance of a concrete occupation, e.g., different technologies.

The link between school and production is implemented in practical training. It is especially important in secondary vocational schools.

The five-day working week is divided as follows (survey shows the proportions of practical and theoretical instruction in the curriculum on the example of three and two year courses:

Four year study courses safeguard the education of youth for highly skilled occupations with high demands on intellectual abilities. They should show adaptibility, understand the cultural aspect of work, be able to communicate and direct. Such occupations are often faced with the introduction of new technologies, and the educational level as workers should therefore be the same as that obtained through full secondary education.

Three year study courses are the most wide spread and prepare pupils for a great variety of skilled occupations. Here the demands on intellectual and practical abilities are balanced. With the aim of deepening the practical training of the pupils, a four months on-the-job training is included after the third year of study. The pupils thus start employment when they have reached the age of 18.

Two year vocational courses serve to educate and train for less skilled occupations. The course is extended by a four months period of on-the-job training so that the young workers start employment after they have reached the age of 17. The proportion of workers who have completed a two year vocational course is the smallest. This is closely linked with the requirements of the economy.

Two and three year vocational schools may be followed by study courses in which the pupils may extend their knowledge and skills to the level of full secondary education.

Each study course is designed for several apprenticeships - broad knowledge of a polytechnical character relates to the whole technological field. Extra-mural study courses for part-time students (including adults) take five years.

For the basic school leavers who have not successfully completed all grades, two year apprenticeships are set up at secondary vocational schools with specially modified curricula which prepare the apprentices for simple occupations.

The division of labour in the individual sectors of production and other sectors of the economy significantly influences the kind of preparation. In those cases where the division of labour and thereby also the nature of the occupation is mainly derived from the manufactured object (e.g., watchmaker, chimneysweep, bricklayer) we deal with the so called apprenticeships. In industrial production, especially in those

Table 8. Curriculum for a three year apprenticeship course
containing high level of theoretical knowledge

Subject	Number of periods per week			
	1	Year 2	3	On-the-job training x)
Main medium (grammar and literature)	2	2	2	-
Russian	2	1	1	-
Civics	1	1	1	-
History	2	-	-	-
Mathematics	4	2	2	-
Physics (Chemistry)	3	2	1	-
Chemistry (Physics)	2	-	-	-
Physical education and sport	1	1	1	-
Paramilitary education	1	1	1	-
Technical subjects- theoretical	8	8	8	-
Subjects of practical training	6	14	20	14 weeks
T o t a l	32	32	37	14 weeks

x) Period of on-the-job training: from September to December, i.e., for a period of 4 months all lessons will be devoted to practical training and preparation for their final examinations.

Table 9. Curriculum for a three year apprenticeship course
with a bias on manual skills

Subject	Number of periods per week Year			on-the-job training x)
	1	2	3	

Main medium (grammar and literature)	2	2	1	-
Russian	2	1	1	-
Civics	1	1	1	-
History	2	-	-	-
Mathematics	4	2	1	-
Physics (Chemistry)	3	2	1	-
Chemistry (Physics)	2	-	-	-
Physical education and sport	1	1	1	-
Paramilitary training	1	1	1	-

Technical subjects- theoretical	7	8	6	-

Subjects of practical training	6	14	24	14 weeks

T o t a l	31	32	37	14 weeks

x) Period of on-the-job training: from September to December
all lessons will be devoted to practical training and
preparation for final examinations

Table 10. Curriculum for a three year apprenticeship course
in the service industries

Subject	Number of periods per week			
	1	2	3	on-the-job training x)
Main medium (grammar and literature)	2	2	2	-
Russian	2	1	1	-
Second foreign language	2	2	2	-
Civics	1	1	1	-
History	2	-	-	-
Mathematics	4	2	2	-
Physics(Chemistry)	2	2	-	-
Chemistry(Physics)	2	-	-	-
Physical education and sport	1	1	1	-
Paramilitary training	1	1	1	-
Technical subjects - theoretical	7	6	7	-
Subjects of practical training	6	14	20	14 weeks
T o t a l	32	32	37	14 weeks

x) The period of on-the-job-training: from September to December all lessons will be devoted to practical training and to preparation for the final examinations

Table 11. Curriculum for two year apprenticeship

Subject	Number of periods per week		
	Year 1	Year 2	on-the-job training x)
Main medium (grammar and literature)	2	2	-
Russian	2	1	-
Civics	1	1	-
History	2	-	-
Mathematics	4	2	-
Physics (Chemistry)	3	-	-
Chemistry (Physics)	2	-	-
Physical education	1	1	-
Paramilitary training	1	1	-
Technical subjects-theoretical	7	10	-
Subjects of practical training	6	14	14 weeks
T o t a l	31	32	14 weeks

x) On-the-job training: from September to December all lessons will be devoted to practical training and preparation for final examinations

Table 12. Curriculum of a three year evening course

Subject	Number of periods per week		
	Year		
	1	2	3
Main medium (grammar and literature)	2	2	2Mp
Russian	4	2	2Mp
Civics	1	1	1
Mathematics	4	2	2Mv ₁
Physics (Chemistry)	2	2	2Mv ₁
Chemistry (Physics)	3	-	-
Technical subjects	2	9	9Mv ₂
T o t a l	18	18	18

Note: Mp compulsory subject for final examination
Mv₁ elective subject for final examination (either mathematics or physics or possibly chemistry if relevant).
Mv₂ elective subject for final examination (one of two technical subjects).

As against the previously descriptive character of teaching these subjects, their teaching is now conducted in continuity with general education, namely the natural science subjects and fundamentals of technology. A significant part of the course is devoted to studying those elements which are present in new technologies.

In view of the great scope and variety of jobs the fundamentals of technology are taught in different ways to different specialisations. Parts of the course are common to all specialisations.

Understanding the fundamentals of technology allows the pupil to master within a shorter period of time the subject matter of special subject, both in theory and practice.

A typical example of a fundamental technology is engineering. It acquaints the student with the basic assemblies, functions and elements of machines and equipment and their operation.

Special technical subjects provide the students with specialized knowledge of the working processes within a certain technology. Their content is varied according to the different apprenticeships and study courses. Knowledge acquired in the special technical subjects is theoretical basis for the acquisition of practical skills. It allows the pupil to master the working operations as he understands the structural relations within the given technology. A significant component is the supply of innovations introduced by scientific and technological advance.

A typical example of a special technical subject is specialised technology, a subject aimed at explaining the substance of the individual stages of technological processes (working operations and technological processes and procedures) and their functions in a certain technology as a whole.

Practical training is geared to the requirements of the special course. In the first stage of training the future worker is familiarized with basic and typical operations. In the last stages of his preparation, he acquires special mental and manual skills which will, on completion of the course, allow him to perform independent operations in the given occupation. Conditions are created to prepare the worker to be able to perform operations at the highest level of his qualification. These conditions are provided by practical training and by laboratory practice.

Laboratory practice is important for those who will be engaged in production, but especially for those who will be engaged in laboratories, testing stations, pilot plants, etc.

Tertiary specialized and technical education

Specialized and technical education is provided in the Czechoslovak Socialist Republic at higher education level, both at universities and at technical colleges. The content of the study courses is conceived in compliance with the trends of development of the respective scientific fields and of the needs of scientific practice. It respects pedagogical and psychological principles and is rid of obsolete practical knowledge and excessive factography. The structure of specialized and technical education at the tertiary level and its scope encourage the students' abilities to apply theory to social practice creatively; they stimulate and prepare the student for continuous education.

A new and indispensable characteristic of the content of studies at institutions of technical colleges of tertiary education is the emphasis placed on the problems of the rationalization of production processes, advanced production methods and new technologies which permit maximal saving of raw materials, other materials, energy and labour. Increasingly significant are the social science disciplines, such as psychology, sociology, pedagogy and aesthetics. Many forms of socio-political work the students perform prepare them for active public political, educational, cultural and hobby activities.

The study courses are organized for the maximum acquisition of practical skills and habits. They lead to the mastering of methodology of specialized disciplines, to creative and logical thinking. This concept of specialized and technical study at the tertiary level allows the graduates to adapt quickly to the changing conditions and requirements ensuing from scientific and technological progress and to use creatively, and implement practically new specialized and technical knowledge. The concept is based on the mastering of theoretical foundations and on a broadly based specialized education. It fully safeguards the ability of the graduate to work effectively and to adapt relatively quickly to concrete working conditions.

Tertiary education in the Czechoslovak Socialist Republic is based on the foundations of Marxism-Leninism, on the Marxist-Leninist dialectical methodology and gnoseology which equips the graduate with the ability to evaluate critically any situation and to take a correct decision in the process of management.

Tertiary education answers the requirements of the development of the respective scientific field and anticipates the development and structural changes in social practice. It fosters a positive attitude to culture and arts as an important influence on the formation of personality and life style.

Tertiary specialized and technical education follows on the full secondary school education and develops as an open, rational system which is consistently extended in harmony with the current and prospective needs of the development of a socialist society. Post graduate studies are governed by the same principles.

Specialized and technical studies at university level train highly qualified personnel with a relatively broad specialized orientation in the given field. The aim of the studies is to enable the students to master the content and methodology of the individual discipline, to learn to think creatively, to synthesise acquired knowledge and to use it for theoretical and practical solutions. The structure and content of these studies are unified on a nation-wide basis, allowing partial modifications according to local conditions.

In order to enable all capable and talented people to acquire university education and to implement the knowledge acquired at this level as efficiently as possible in social practice, tertiary education is organized not only in the form of day courses but - insofar as the nature of the study field permits - in the form of various part-time study courses for employed persons, correspondence study, evening courses, external study and combined courses. Part-time study is an important component of the system of higher education and its importance is growing with the continuous rise of the educational level of the nation.

The structure of the fields of study in specialized and technical tertiary education is conceived with emphasis on the progress in science. Education in fields with a relatively low demand for specialists is organized may involve scholarships abroad.

Further development of specialized and technical tertiary education is considered in the context of the world socialist system.

The length of specialized and technical education at Czechoslovak universities is 4 to 6 years, according to subject.

The educational process at institutions of tertiary education does not differ from other schools as far as the fundamentals of socialist educational values and principles are concerned. The leading principles are the unity of the educational process and the link of the school with practical life. The specificity of the educational process at institutions of higher education may be seen in their link with research and scientific establishments and in the active participation of students in this kind of work. This kind of work is often done independently, or in seminars or practicums, and through the participation of students in social practice, especially research.

The curricula of university education are uniform for the whole territory of the Czechoslovakia. They proceed from the educational aims, from scientific forecasts of each scientific and technical field and from the needs of society. The curricula contain an optimal ratio of theoretical knowledge and practical application.

A more detailed characteristics of specialized and technical tertiary education of Czechoslovakia would require an independent thesis which exceeds the scope of this study.

III. SOME REMARKS ON THE PLANNING OF THE DEVELOPMENT OF SPECIALIZED AND TECHNICAL EDUCATION IN THE CZECHOSLOVAKIA.

The Communist Party and the Government of Czechoslovakia give primary attention to the development of education in Czechoslovakia in general and to the development of specialized and technical education in particular. Thanks to this, specialized and technical education has recorded an unprecedented development since the end of the second world war. This is brought out by the following table.

Table 13. Number of specialists with university education, with full secondary education and with secondary education - 1960-1978¹

With university education		Specialists with full secondary and secondary education
1960	157 063	630 881
1978	420 956	1 338 631
Index 78/60	268	212

Note: ¹ In 1978 a total of 7 297 295 people were employed in the national economy of the Czechoslovakia, of this 45.3 per cent women.

In the school year 1980/81, specialized and technical education was provided by 876 institutions training youth for worker occupations with a total of 14,332 classes and a total of 392,250 pupils and 554 secondary technical schools with a total of 7,133 classes and a student population of 243,166 students. In the same period, 36 universities were attended by 147,862 undergraduates who studied at 110 faculties; of this 35.5 per cent at universities, 45.4 per cent at tertiary technical colleges, 8.2 per cent at tertiary colleges of economics, 10.1 per cent at tertiary colleges of agriculture and 1.1 per cent at art academies.

In the same period, 12,030 part time students attended secondary school courses, out of this 92.3 per cent secondary technical schools and 45,138 at institutions of tertiary education.

The development of scientific and technical education is purposefully planned and developed in order to produce personnel to fill specialized and technical occupations. The plan expresses harmony of social interests, arising from the objective demands of the development of society and of individual interests, concerning life style social activity. Individual differences may arise but they are not of a basically antagonistic character. With the development of socialism, elimination of differences becomes more and more easy.

The development of specialized and technical education and the institutions that provide it is controlled and planned by the State. The plan is concerned with the scope and structure of the performance of specialized and technical education, with the development of scientific research work, as well as with the development of material and personnel. The plan aims to combine social, cultural and economic aspects of educational development.

The planning activity leads to attempts at forecasting. The prognoses, while respect in the basic features of the social reproduction process, try to identify the newly arising trends and attempts to find solutions for the implementation of the positive aspects. Their character is purely that of recommendations.

Long-term planning of the development of scientific and technical education poses a problem as to for how long a period is it expedient to plan and in what detail.

There can be no doubt as to the complexity of the solution of the indicated problem - it requires consistent research which would define the limitations which hamper long-term determination of the needs of scientific and technical education. The limitations stem from the fact that education is a social process and as such linked with the division of labour.

In this context, special attention is given to the study of the following questions:

- adaptability of technical and scientific workers,
- substitution of scientific and technical workers,
- mobility of scientific and technical workers.

According to Marc, the division of labour in modern industrial society presupposes a complete versatility of the working person, total

adaptability, answering to the changes in requirements. The problem of adaptability must therefore be taken into consideration in determining the structure of future scientific and technical education in each profession and occupation. The progressive division of labour resulting mainly from scientific and technical progress requires that the working people be more and more adaptable, i.e., that they have the ability to change concrete activities. The new concept of socialist education aims to make a decisive contribution towards this aim.

Modern educational concepts are in line with the policy of economy of manpower; substitution in operates i.e., technical and specialized workers of different qualifications are interchangeable. This makes it possible for a specialist or technician of one specialization or a worker of one occupation to do several types of activities equally successfully. It also means that a certain type of activity may be carried out by specialists and technicians at different levels of specializations. Substitution may operate vertically, i.e., a worker, having another worker with a different level of education, or horizontally, i.e., a worker with one qualification substitutes a worker with another qualification. The actual implementation of substitution depends on numerous social factors. What has been said in the previous chapters about the Czechoslovak educational system and its important component - scientific and technical education - shows how the progressive concept of such a system can contribute to a high level of adaptability.

A relatively separate question is that of mobility of technical and specialized workers, i.e., their ability and preparedness to change jobs and workplace completely. It is based on acquired adaptability. Mobility is strongly influenced by a wide range of social and economic factors - the planning of the development of technical and scientific education does not influence it.

Special attention is being devoted to finding new improved methods in the planning of the needs of specialized and technical education.

The key problem that remains to be solved is the correct determination of the social demand for specialized and technical education and on the basis this determination to set up adequate means and methods.

In determining the social demand for specialized and technical education, Czechoslovakian authorities apply the following criteria:

- (a) An analysis of the past history of the social need for education and determination of developmental trends and the laws which governed them;
- (b) On the basis of (a) to analyse correctly the current state of the social need for education;
- (c) both above to serve as a guide in the possible changes and to incorporate them in the given period of the plan.

In simplified terms, each type of analytical method corresponds to a certain method of forecasting, e.g., microanalysis serves as a basis for setting up models of the structure of the social need for education.

In analysing phenomena which are common to many social aspects the following methods are used:

- statistical compilation of data and evaluation;
- mathematical methods;
- interviewing sample groups and direct surveys;
- analysis of norms;
- comparative methods;
- estimating.

Use of more than one method is recommended, especially their comparison. From the organizational point of view the following methods are applied:

- global, macroanalytical (levels of education, subjects, types of school, local requirements, etc.).
- microanalytical (laboratory, university department, centres of studies, workplace, etc.),
- mesoanalytical (type of school, faculty, institute, university).

We are concerned basically with finding the best way by which to ascertain with accuracy changes in the demand for specialized and technical education in accordance with the changes in the number of specialists and with the structure of the national economy. Suitably devised methods make it possible to detect and identify factors which will determine the development of the numbers and type of specialized and technical workers. This entails a consistent analysis of the effects valid currently and of the expectations in the nearest future. In the latter, we are aiming at an improvement in the identification of factors arising from the advancing scientific and technical revolution and its effect

on the structural changes in the national economy. Priority must be given to the development of those sectors of the economy which demand changes in the qualification of workers. In Czechoslovakia, it is the character of transition from an extensive economy to intensive economy. In assessing these changes accurately it will be possible to ascertain the social need for education and especially for specialised and technical education.

An activity concerned with the improvement of the organization, planning and management of specialized and technical education is complex, gradual and continuous. Its aim is to answer to the needs of the requirements of the economy as a whole. It is very difficult to find optimal solutions to one aspect (specialized and technical education), without the knowledge of the optimal criteria governing the whole system.

In the late 1960s and in the early 1970s high level discussions took place aimed at solving the problem of the extent as to which it is necessary and possible to develop the educational system, including specialized and technical education, in an advanced socialist society. On the basis of these discussions, the Communist Party document referred to above was published. The educational system is conceived as an open system, maximally capable of responding to future demands made by the advancing socialist society.

The problem area of the further development of the educational system by far exceeds pedagogical questions. It is concerned with the role of education as a significant economic growth factor with the effect of education on the national income, i.e., with the educational fund as an economic category. It is concerned to a large extent with the social character of education, i.e., educational qualification.

Considerations based on the knowledge of the economics of education based on the Marxist-Leninist theory of the value of labour led to a better understanding of the role of education in the socialist reproduction process as well as to a better understanding of the qualification requirements. The theory of the value of labour and the theory of the fund of education which is based on it is founded on the category of abstract labour while the qualification requirements are based on the demand for concrete labour. Questions related to insure expectations of the requirement for manpower and qualification in the reproduction process of the socialist society are also being considered.

In planning specialised and technical education, it must be observed that the scope and structure of specialised and technical teaching corresponds with the changing conditions in the social process of labour. This is also valid conversely, i.e., increasing the scope of education changes the structure of qualified working people. Economically necessary qualification is the decisive criterion. However, education is a social process and as such will fulfil other roles, too, namely the formation of an allround socialist citizen, in harmony with society around him.

The need for continuous improvement in planning the development of technical and specialised education, i.e., of the various types of technical and vocational schools, requires to consider systematically numerous other problems. For instance, the fact that the structure of educational requirements does not fully correspond with the structure of the performance in the given type of school deserves attention. Performance may be determined by the educational level achieved in the given fields of study, and by success in the vocation. The actual requirements for various qualifications are expressed primarily by the manpower required for certain jobs. Translating the numbers back to the requirement for qualifications for certain jobs is a secondary act.

In planning the development of specialised and technical education, special attention is given to the solution of shortages in certain qualifications. This means that apart from the replacement of retiring or deceased specialists and technical workers, or those who have for other reasons temporarily or finally left, and apart from safeguarding the numbers of specialized and technical workers required for expansion or intensification of the reproduction process, emphasis is given eliminating real shortcomings in the required qualification standard.

Also taken into consideration are the consequences of the trends of the systematic intensification of the reproduction process in dependence on the development of the national economy. This concerns mainly education and training of specialized and technical personnel for R&D institutes of the Czechoslovak R&D base.

In the field of forecasting and long-term planning of the development of specialized and technical education, we are mainly concerned with overcoming a tendency in which special attention is devoted to processing

prognoses and long term plans with regard to the individual branches of the national economy and less attention is devoted to processing theoretical and methodological considerations which would improve long-term planning of the requirements for certain qualifications in the whole economy (the elimination of inter-branch overlapping, etc.).

Further improvements are called for in the methods used for identifying the requirements for specialized and technical workers, be it questionnaires, personnel vetting, international comparisons, macroeconomic modelling, (e.g., regression and stimulation models of personnel development) etc.

Perfecting advanced methods of planning and development of specialized and technical education will require an improvement in research activities. The urgency in defining the needs of further development of specialized and technical education as an active factor in the development of social production and in the development of a socialist personality underlines the urgency in solving problems connected with the improvement in planning, organization and management of this type of education.

CONCLUSION

The aim of the study is to show on the example of Czechoslovakia how the question of the integration of specialized and technical education and training of the young generation and adults is being solved through the current reform of the educational system. The authors have strived to put emphasis mainly on those aspects of the Czechoslovak experiences which would be of interest to other countries, especially the developing nations.

The study will have fulfilled its purpose if it has conveyed to the reader how the principle of further democratization of education, the principle of connecting school and life, and a number of other principles important for the development of specialized and technical education are being implemented in the Czechoslovak educational system.

We proceed from the postulate that only that educational system which is linked with life can fulfil its social mission. This can be achieved if the system responds to the social needs and demands and if the forms, means and methods, applied in educational work are capable of reflecting the development of the scientific potential.

The authors are well aware that within the scope of the given study they were only able to give a simplified presentation of the problems connected with the development of specialized and technical education at higher educational level. This problem area is vital in many ways and would deserve an independent monographic treatment.

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